

Notes on range extension and geographic variation of calls in *Adenomera thomei* (Anura: Leptodactylidae)

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ABSTRACT: New localities are herein reported for *Adenomera thomei* in Minas Gerais state, increasing its known distribution towards the Brazilian northwest and expanding knowledge on its habitat use. The advertisement calls of *Adenomera thomei* here reported exhibit variation in the call parameters known for this species, but also reveal a degree of overlap with the calls of a closely related undescribed species, suggesting that further research is needed to elucidate geographic call variation and population identities.

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INTRODUCTION

Members of the genus *Adenomera* have been variously considered as either under the genus *Leptodactylus* (e.g., Heyer 1973, Frost *et al.* 2006) or as a valid genus (more recently by Pyron and Wiens 2011). *Adenomera thomei* (Almeida & Angulo, 2006) (Figure 1), a member of the *Leptodactylus* “*marmoratus*” group *sensu* Heyer (1973), was described as *Leptodactylus thomei* from northern Espírito Santo, Brazil. It is known to occur in cocoa plantations (Almeida and Angulo 2006), lake edges, on grass (Almeida and Gasparini 2010), and its reproduction involves deposition of eggs in a foam nest, with tadpoles developing in water (Almeida and Angulo 2002). Subsequent to its description this species was found in another locality 200 km south of the type locality, still within the state of Espírito Santo and at a comparable elevation to the type locality (Almeida and Gasparini 2010); it is also possible that it may occur at one other locality in northern Espírito Santo, Governador Lindenberg (Almeida and Angulo 2006). More recently, Fouquet *et al.* (2014) reported *A.*

thomei from the states of Espírito Santo (ES), Minas Gerais (MG), São Paulo (SP) and Rio de Janeiro (RJ).

Herein, new localities are reported for *Adenomera thomei* and the geographic variation of its calls is assessed. The new geographic records are from southern Minas Gerais state, Brazil, expanding the range of *A. thomei* towards the Brazilian northwest (Figure 2). It has been found in a variety of different habitats in the new localities, including seasonal semi-deciduous Atlantic Forest fragments, located in the municipality of Alfenas (21°25'25.52" S, 46°7'17.96" W; Figure 3), in a disturbed forest fragment edge (21°23'1.52" S, 45°55'59.14" W), also in Alfenas, and an open area with evidence of substantial anthropogenic disturbance (20°44'27.05" S, 46°36'58.04" W), in the municipality of Passos (Figure 4). The altitudinal variation of the different sites ranged from 747–798 m asl.

All individuals recorded were calling males; acoustic



FIGURE 1. Adult male of *Adenomera thomei* collected in a forest fragment in Alfenas municipality, state of Minas Gerais, southeastern Brazil (Voucher CHARW A2440) (Photo: Lucas Ferrante).



FIGURE 2. Map depicting the range extension of *Adenomera thomei*. Pink triangle represents the type locality; blue circles represent currently known localities; red stars represent the two new localities in the municipality of Alfenas; the yellow star represents the new locality in the municipality of Passos, state of Minas Gerais, southeastern Brazil. Legend: Espírito Santo (ES); Minas Gerais (MG); Rio de Janeiro (RJ); and São Paulo (SP) states.



FIGURE 3. Calling site in forest fragment presenting dense leaf litter layer, saturated soil and stagnant pools, with the presence of palm trees (*Euterpe edulis*) in the municipality of Alfenas, state of Minas Gerais, southeastern Brazil (Photo: Lucas Ferrante).

signals were recorded using a ZOOM H4n recorder with integrated X/Y stereo condenser microphones: two males (from the forest fragment) had their calls recorded and five (from the open disturbed area) were just collected. Recorded calls were compared to that of *A. thomei* from the type locality (Almeida and Angulo 2006). The Minas Gerais vouchers were compared to material pertaining to this species deposited in the Célio Fernando Baptista Haddad collection (CFBH), Universidade Estadual Paulista “Júlio de Mesquita Filho” (Unesp, Rio Claro, SP). All collected specimens were deposited in the Coleção Herpetológica Alfred Russel Wallace (CHARW) of Universidade Federal de Alfenas (Unifal, MG). Snout-Vent Lengths (SVL) varied as follows: 22.68 ± 1.09 mm; range of 20.89–24.00 mm ($n = 5$).

At the preserved forest fragment site the two individuals were found calling in December 2011 between 18:00–20:30 h. During this period air temperature was 23.9°C and relative air humidity was 84%. The area had a dense leaf litter layer, saturated soil interspersed with stagnant pools, and with the presence of palm trees (*Euterpe edulis*). In the disturbed forest fragment edge air temperature was 24°C and relative humidity 65%.

Temporal and spectral acoustic parameters for the two males ($n = 27$ calls, $n_1 = 12$ for male 1 and $n_2 = 15$ for male 2) varied as follows: 110–170 ms for call length; 14–29 calls/min; 10–15 pulses/call (number of pulses per call); 2024–2368 Hz for the fundamental frequency (the lowest frequency of the waveform); and 4048–4737 Hz for the dominant frequency (Figure 5). Call length and dominant frequency definitions and measurements follow Cocroft and Ryan (1995). For call parameter analysis the program Sound Ruler 0.9.4.1 (Gridi-Papp 2003) was used, with sampling frequency of 44.1 kHz and 16 bit precision; the oscillogram and spectrogram were produced with the program Raven Lite 1.0 (Cornell Lab of Ornithology 2003–2009). These ranges place the two males recorded in Alfenas within the ranges of individuals of *A. thomei* recorded from the type locality, although the frequency ranges for individuals recorded here can reach fundamental and dominant frequencies below those reported for *A. thomei* by Almeida and Angulo (2006) and below the dominant frequency reported by Fouquet *et al.* (2014, Appendix S2).



FIGURE 4. Disturbed area used as a calling site by *Adenomera thomei* in the municipality of Passos, state of Minas Gerais, southeastern Brazil (Photo: Mario Sacramento).

The dominant frequency range of *A. thomei* from southern Minas Gerais also overlaps with the dominant frequency range (4700–5300 Hz) of the undescribed *Adenomera sp. L* of Fouquet *et al.* (2014, Appendix S2). The observations above suggest that *A. thomei* exhibits a wider tolerance to habitat disturbance than initially thought, being able to occupy various microhabitats in both forested areas and open and disturbed areas.

While it is currently not possible to reject the hypothesis that the individuals from southern Minas Gerais are not *Adenomera thomei* based on known call parameters, it is important to note that there is also a degree of overlap with the calls of the undescribed species L of Fouquet *et al.* (2014), which is considered part of a sister clade to *A. thomei* by these same authors.

Further research is needed to better understand the geographic call variation of populations currently assigned to *A. thomei*.

Numbers of vouchers deposited in the Coleção Herpetológica Alfred Russel Wallace, Universidade Federal de Alfenas: CHARW A902; CHARW A903; CHARW A904; CHARW A905; CHARW A2440; collection license IBAMA/SISBIO 10704-1.

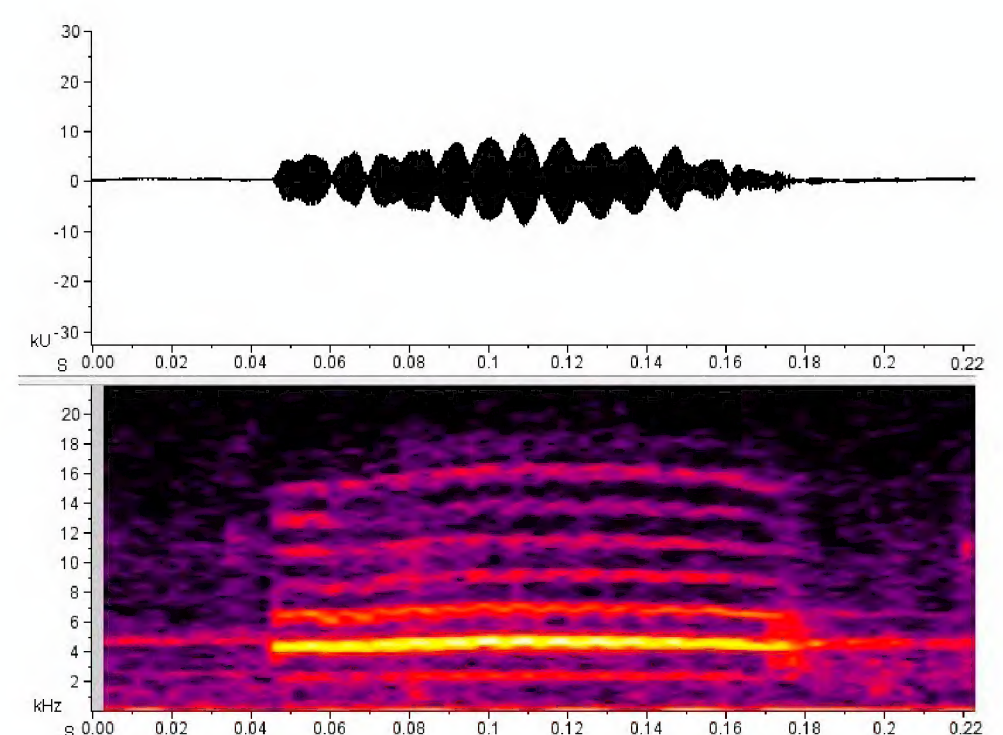


FIGURE 5. Oscillogram and spectrogram of the advertisement call of *Adenomera thomei* from southern Minas Gerais state, voucher depicted in Figure 1 (Voucher CHARW A2440).

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